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Highly specialized in some respects, in both Protopterus and Lepidosiren, this specialization is largely due to a change of habit, and that, undoubtedly, these two types are, generically, very distinct.

In conclusion, I may simply add that this classical work will, in the future, prove to be one of the very greatest value to all students of the morphology of the Amphibia and of Pisces, as it will be indispensable to the general biologist.

OBSERVATIONS ON A CYCLONE NEAR WILLIAMSTOWN, KANSAS.

BY E. H. S. BAILEY, UNIVERSITY OF KANSAS, LAWRENCE, KAN.

A SEVERE and fatal cyclone visited a small area of country in the Kaw valley, in Jefferson County, on June 21, at about six o'clock in the evening, and the peculiar topography of the country gave an opportunity to make some observations that may be of scientific interest. The valley at this point is about two miles in width, the river running nearly east. On the south side it is bounded by bluffs about a hundred feet in height, and on the north side there is a strip of level meadow, something over a mile in width, before one reaches the bluffs, which are of about the same height as those on the south side.

The general trend of the broad valley is east, but at a point a mile or so beyond where the cyclone lifted the river runs toward the southeast for perhaps a mile. On the particular afternoon in question the weather had been extremely hot and sultry, the mercury ranging between 90° and 95° F. The weather had been warm and dry, with only one local shower for about two weeks. About two hours before the cyclone burst upon the valley there was a gathering of clouds in the northwest, with thunder and lightning. A short time before the storm burst an ominous stillness was noted, and a sudden darkening of the sky. During the heaviest of the storm a peculiar green tint of the sky was noticed in the locality.

As the storm came from the west, it seemed to settle near the ground at the base of the bluff, and, wherever the bluff was not broken by lateral valleys, its path was about one-half on the side of the hill and the other half on the sloping meadow to the south.

Wherever the cyclone crossed the course of lateral ravines, even if they were quite narrow, it dipped down into them and destroyed trees and buildings. It was not swerved from its general eastward course even at one point where a broader valley joined that of the Kaw. At this point, as the country was heavily timbered, there was a special opportunity to observe the action of the wind. Elm and walnut trees, two or three feet in diameter, were either torn up by the roots, laid prostrate, or twisted off fifteen or twenty feet from the ground. Here the track of the cyclone, where it did appreciable damage, was a little less than 600 yards in width. There were, occasionally, wrecked chimneys and slightly injured roofs on the outer edges of this path. All along the course of the storm the debris was deposited in the peculiar way that is characteristic of these furious whirlwinds. The material north of the centre of the track was deposited in lines from northwest to southeast, and that on the south side of the centre in lines running from southwest to northeast. In the centre of the track there was a tendency to distribute the material in an east and west direction. A line of telephone poles on the south side were laid in parallel lines, thus, // /// /. Fields of grass and wheat were beaten to the ground and the stalks laid in the directions above noted: W. \ / \ / \ / \ / \ / → E. The wires of

the telephone line and of the barb-wire fence were lifted into the tree-tops about fifty feet north of their original position. There was a little debris deposited on the west side of some of the buildings demolished, but most of it was carried along the track and thoroughly pulverized. Strong, new farm wagons were wrenched to pieces, and the spokes were even broken off near the hub, before they were deposited half a mile away.

The terrible force of the wind could be seen in the beheading of the wheat, the uncovering of potatoes in the hills, the transportation of grave-stones 300 yards, and the picking of all the feathers from the chickens

One of the most interesting effects that was noticed was upon

the trees that were left standing or laid prostrate and bereft of every vestige of foliage and of nearly all the bark. All the wood on the west side of these trees, often being exposed by having the bark torn off, was roughened as if by a sand blast; while that on the east side was smooth. This roughness was uniform, showing that it was not produced by occasional missiles hurled through the air. This roughening, if not produced by the actual friction of the air, must have been produced by the sand and gravel in the air, or by the rain that beat against the surface.

Some who witnessed the storm saw the clouds of dust that accompanied the wind, so the sand-blast theory is no doubt the correct explanation.

The most serious work of destruction was accomplished just before the cyclone lifted. Here the valley broadened out towards the north, and the bluff for a distance of a mile or more disappeared. With one last sweeping blow the storm lifted, and the only other evidence of its work was a partially demolished barn. Just at the point where the intensity seemed concentrated, the path was much narrower than farther west. The strip of land devastated was about five miles in length. From the manner in which it followed the base of the bluff, one would infer that had it not been for this obstruction the storm would have passed off towards the northeast instead of pursuing, as it did, a direction a little south of east.

NOTES ON THE COPEPODA OF WISCONSIN.

BY C. DWIGHT MARSH, RIPON, WISCONSIN.

In the waters of Wisconsin and in the adjacent lakes are found the following twenty-one species of free-swimming copepods: *Diaptomus sanguineus*, Forbes; *D. leptopus*, Forbes; *D. pallidus*, Herrick; *D. sicilis*, Forbes; *D. ashlandi* sp. nov.; *D. minutus*, Lillj.; *D. oregonensis*, Lillj.; *Epischura lacustris*, Forbes; *Limnocalanus macrurus*, Sars; *Cyclops americanus*, sp. nov.; *C. brevispinosus*, Herrick; *C. pulchellus*, Koch; *C. naevus*, Herrick; *C. parvus*, Herrick; *C. leucarti*, Sars; *C. signatus*, Koch; *C. modestus*, Herrick; *C. fluviatilis*, Herrick; *C. serrulatus*, Fischer; *C. phaleratus*, Koch; *C. fimbriatus*, Fischer.

Although two of these, *D. ashlandi* and *C. americanus*, are new species, it is not probable that they are peculiar to the Wisconsin fauna. The copepods of America have thus far received very little attention, the only important publications on the subject being by three men, Professor Cragin, Professor Herrick and Professor Forbes. If more were known of our copepods it is probable that it would be found that there are few local differences in the faunæ of our northern States. The copepods are readily transported from one body of water to another and, without change of structure, seem to endure great changes in their environment. In fact, half of our species of cyclops are not only widely distributed in America, but are identical with those of Europe. Those that may be considered distinctly American are closely allied to well-known European forms.

C. leucarti is found in nearly all parts of the world where collections have been made and, so far as can be inferred from the published descriptions, varies but little, even in the minute details of its structure.

C. americanus closely resembles *C. viridis*, and is probably the species which has by other American authors been identified with *viridis*. Although there seems to be good reason for separating it from the European species, the similarity of the two forms is so great that it is only by a close examination that the structural differences become apparent.

It is very possible that *C. brevispinosus* should be considered a pelagic variety of *C. americanus*, thus reducing by one the number of species peculiar to America. There is some reason, too, for supposing that *C. navus* is not specifically distinct from *C. mulchellus*.

C. pulchellus is the common pelagic form of the Great Lakes. Although found in smaller lakes, it is more commonly replaced by *C. brevispinosus*, which is a species of wide distribution.

The most common of all our species is *C. serrulatus*. Rarely is a collection without this form, which seems to adapt itself easily to very different surroundings. It has, however, wide